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Claims

[c1] What is claimed is:

An inerting system comprising:

an air source supplying pressurized air;

at least one fuel tank circuit associated with at least one fuel tank;

a heat exchanger cooling said pressurized air;

at least one air separation module in communication with said heat exchanger and separating inerting gas from said pressurized air; and

a controller controlling flow rate of said inerting gas.

[c2] A system as in claim 1 further comprising a bleed air outlet in fluid communication with said heat exchanger, wherein said heat exchanger receives said pressurized air from said bleed air outlet.

[c3] A system as in claim 1 further comprising an ozone converter converting ozone contained within said pressurized air to oxygen.

[c4] A system as in claim 1 further comprising a ram air inlet supplying cool air to said heat exchanger.

[c5] A system as in claim 4 wherein said ram air inlet receives ram air from a ram air system.

[c6] A system as in claim 1 further comprising a temperature sensor coupled to air flow line and generating a temperature signal, said controller adjusting flow of air through said heat exchanger in response to said temperature signal.

[c7] A system as in claim 1 further comprising a filter in fluid communication with said heat exchanger and filtering at least a portion of said pressurized air.

[c8] A system as in claim 1 further comprising a main check valve fluidically coupled between said at least one air separation module and said at least one fuel tank and preventing reverse flow of said inerting gas or fuel.

[c9] A system as in claim 1 wherein said at least one fuel tank circuit comprises at least one flow rate control valve and orifice, said controller coupled to said at least one control valve and altering flow of said inerting gas to said fuel tanks.

[c10] A system as in claim 1 wherein said at least one fuel tank circuit comprises at least one check valve for preventing reverse flow of fuel.

[c11] A system as in claim 1 wherein said at least one fuel tank circuit comprises at least one float valve for preventing reverse flow of said inerting gas.

[c12] A system as in claim 1 wherein said at least one fuel tank has a common air vent.

[c13] A system as in claim 1 wherein said at least one fuel tank is dual-vented.

[c14] A system as in claim 1 wherein said at least one fuel tank has at least one associated vent check valve, said at least one associated vent check valve controlling airflow through said at least one associated vent.

[c15] A system as in claim 1 wherein the inerting system maintains oxygen content level within said at least one fuel tank to be approximately 12% or less.

[c16] A system as in claim 1 wherein said controller utilizes low-flow bleed air during at least one of mode selected from a climb mode and a cruise mode of an aircraft.

[c17] A system as in claim 1 wherein said controller modulates ram airflow to maintain inlet temperature of said at least one air separation module.

[c18] A system as in claim 1 wherein said at least one air separation module in separating inerting gas from said

pressurized air separates nitrogen-enriched air from said pressurized air.

[c19] A system as in claim 1 wherein said controller operates in at least one inerting system mode.

[c20] A system as in claim 1 further comprising an ejector within at least a portion of and circulating gases in said at least one fuel tank.

[c21] A system as in claim 20 wherein said ejector circulates gases in said at least one fuel tank.

[c22] A system as in claim 1 wherein said at least one fuel tank is a center tank.

[c23] An inerting system comprising:
an air source supplying pressurized air;
at least one fuel tank circuit associated with at least one fuel tank;
a heat exchanger cooling said pressurized air;
at least one air separation module in communication with said heat exchanger and separating inerting gas from said pressurized air, said at least one air separation module having at least one shroud receiving exhaust air; and
a controller controlling flow rate of said inerting gas.

[c24] A method of supplying inerting gas to at least one fuel tank of an aircraft comprising:
receiving pressurized air;
cooling said pressurized air;
separating inerting gas from said pressurized air; and
controlling flow of said inerting gas from at least one air separation module to the at least one fuel tank.

[c25] A method as in claim 24 further comprising utilizing low-flow bleed air during at least one of mode selected from a climb mode and a cruise mode of the aircraft.

[c26] A method as in claim 24 further comprising maintaining oxygen content level within the at least one fuel tank to be approximately 12% or less.

[c27] A method as in claim 24 further comprising modulating ram airflow to maintain inlet temperature of at least one air separation module.

[c28] A method as in claim 24 wherein said inerting gas is supplied to the at least one fuel tank when the aircraft is on the ground.

[c29] A method as in claim 24 wherein said inerting gas is supplied to the at least one fuel tank when the aircraft is in flight.

[c30] A method as in claim 24 further comprising operating in multiple inerting system modes.

[c31] A method as in claim 24 further comprising circulating fluids gases in said at least one fuel tank.

[c32] A inerting system for an aircraft comprising:
at least one fuel tank circuit having at least one fuel tank;
a bleed air source;
a heat exchanger in fluid communication with and receiving pressurized air from source, said heat exchanger cooling said pressurized air;
at least one air separation module in fluid communication with said heat exchanger and separating inerting gas from said pressurized air;
a main check valve fluidically coupled between said at least one air separation module and said at least one fuel tank and preventing reverse flow of said inerting gas; and
a controller controlling flow of said inerting gas from said at least one air separation module to said at least one fuel tank.

[c33] A system as in claim 32 further comprising an ejector within at least a portion of said at least one fuel tank and circulating fluid flow in said at least one fuel tank.

[c34] An aircraft inerting system for an aircraft comprising:
an air source supplying pressurized air;
at least one center fuel tank;
an air manipulation and separation circuit having at least one air separation module and separating inerting gas from said pressurized air; and
a controller controlling oxygen content level within said at least one center tank to be approximately 12% or less.

[c35] A system as in claim 34 further comprising a heat exchanger cooling said pressurized air.

[c36] A system as in claim 34 further comprising an ejector within at least a portion of and circulating fluid flow in said at least one center fuel tank.

[c37] A system as in claim 36 further comprising a bleed air outlet in fluid communication with said heat exchanger, wherein said heat exchanger receives said pressurized air from said bleed air outlet.

[c38] A system as in claim 36 further comprising a ram air inlet supplying cool air to said heat exchanger.

[c39] A system as in claim 33 further comprising an ozone converter converting ozone contained within said pressurized air to oxygen.

[c40] A system as in claim 34 wherein said at least one fuel tank circuit comprises at least one float valve for preventing reverse flow of said inerting gas.